REMARKS

This is in response to the Office Action mailed September 29, 2003. Applicant respectfully traverses and request reconsideration.

Rejection Under 35 U.S.C. §112, ¶2

Claim 20 currently stands rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Claim 20, as amended overcomes this limitation, using similar language as pending claims 9, 14 and 23. Therefore, withdrawal is respectfully requested.

Rejection Under 35 U.S.C. §103(a)

A. Claims 1-7, 15-16 and 18-22

Claims 1-7, 15-16 and 18-22 currently stand rejected under 35 U.S.C. §103(a) as being unpatentable over Dockerty et al., U.S. Patent No. 5,796,169 (hereinafter refereed to as "Dockerty") in view of Matthies et al., U.S. Patent No. 6,527,159 (hereinafter referred to as "Matthies").

Applicant respectfully traverses and submits that the rejection is improper because the combination of Dockerty and Matthies fails to teach or suggest all of the claimed limitations.

As understood, Dockerty is directed to, among other things, a structurally reinforced ball grid array semiconductor package having a plurality of solder balls 11 disposed relative to a solder paste 12 between a printed circuit board 1 and an integrated circuit device 3. Dockerty discloses utilizing solder balls 11 in conjunction with solder support 16 and 18 having similar circumferential shapes that tubularly extending on the printed circuit board for allowing a larger surface contact area.

As understood, Matthies is directed to providing surface mounting to an irregular surface by providing a solder dispensing machine which dispenses only solder balls but provides variants

in the amount of volume of solder material that is applied. The system of Matthies uses the glue dispensing machine 30 to dispense bumps 14 at a very high rate of speed through a valve 18 and a dispensing nozzle 20. Although, Matthies teaches only to producing bumps of solder material wherein the volume of material for a particular bump is determined by a programmable control of the valve 18 and nozzle 20.

Claims 1, 15 and 21 recited, among other things, the plurality of first solder members disposed on a carrier substrate with the solder dispensing machine and second members disposed thereon with the solder dispensing machine. On page 3 of the present Office Action, the Examiner asserts that Dockerty does not teach the carrier substrate disposed thereon with the solder dispensing machine and the second members disposed thereon with the solder dispensing machine. In view thereof, the Examiner asserts that these limitations are disclosed by Matthies and it would have been obvious to a person having ordinary skill in the art to modify the device of Dockerty by using the solder dispensing machine of Matthies. Applicant respectfully disagrees and submits that the teachings of Matthies fail to teach or suggest the limitations directed to dispensing the second members in view of the teachings of Dockerty.

In support of the teachings of the claimed plurality of second members, the Examiner has asserted the plurality of second members are disclosed by Dockerty as the solder paste 12, such as illustrated in FIG. 1. As recognized by one having ordinary skill in the art, the solder paste, as clearly described by the teachings of Dockerty and known by one of ordinary skill in the art, may be prepared in two main categories, dispensable and printable. On col. 3, lines 60-62, Dockerty discloses that the solder paste is screen deposited onto the context two and eight before the integrated circuit device is positioned. In order to be screen deposited, in accordance with the exact teachings of Dockerty, the solder paste must be a printable solder paste which contains a higher percentage of metal and higher viscosity for application by a squeegee through a stencil or screen. Moreover, printing is accomplished by using a squeegee to move the material across a stencil, such as a perforated metal sheet, or a screen and thereby depositing material through holes in the stencil or screen. Therefore, the application and the disclosure of Dockerty for the stencil paste clearly and specifically teaches the exact opposite from application by a solder dispensing machine. Therefore, if one of ordinary skill in the art were to combine the teachings

of these two references, the combination thereof would at best provide the dispensing of the solder balls 12 through the solder dispensing machine as disclosed by Matthies, but would not be able to apply the paste 11 in accordance with the direct and explicit teachings of Dockerty, specifically being screen deposited as a printable solder paste on the printed circuit board.

As such, one of ordinary skill in the art would not be motivated to combine these references because Dockerty teaches away from the combination of Matthies because the combination of these references would not produce a dispensable second member.

Moreover, assuming *arguendo*, the Examiner asserts that the motivation for one of ordinary skill in the art to combine the references would be "for the purpose of dispensing the bumps (solder balls) at a very high rate of speed, thus minimizing the timing of manufacture." See lines 1 and 2, page 4 of present Office Action. Applicant must respectfully traverse as the combination of these references would produce a system which inherently could not generate solder balls at a high rate of speed. It is submitted that while Matthies discloses rapid disposition of bumps 14, such as disclosed in col. 3, lines 1-11, this is directed to liquid droplets on the order of 20 to 150 microns in diameter. If one of ordinary skill in the art combined these two systems, speed would be severely degraded by the screen deposited solder paste (11) of Dockerty. Therefore, the combination of these two inventions would produce a system which does not operate to generate both the first solder members and the plurality of second members at an improved speed, but would only dispense the first solder members at an improved speed but would be severely limited in the application speed for the solder paste (11) of Dockerty. Therefore, Applicant submits the motivation to combine these references is improper and that one of ordinary skill in the art would not be motivated to combine these references because the combination thereof would produce a system that does not only fail to generate the second members as disclosed by Dockerty, but also if it were to be modified to generate the support brackets of Dockerty, the dispensing machine would lose all levels of liquid droplet dispensing efficiency.

Therefore, with regard to claims 1, 15 and 21, it is respectfully submitted that the present rejection is improper as the combination of Dockerty and Matthies fails to teach or suggest all of the claimed limitations and that one of ordinary skill in the art would not be motivated to

combine these references. As such, Applicant respectfully requests reconsideration and withdrawal of the present rejection.

Regarding claims 2-3 and 22, Applicant respectfully resubmits the above position with regard to claims 1 and 21, respectively. It is further submitted that these claims contain further patentable subject matter and are allowable, not merely as being dependent upon an allowable base claim. As such, reconsideration and withdrawal is respectfully requested.

Regarding claims 4 and 16, Applicant submits these claims contain further patentable subject matter and resubmits the above position offered with regard to claims 1 and 15. Furthermore, these claims recite limitations regarding to a dimension disposed between the printed circuit board and the integrated circuit as defined by the second members, or second solder balls. It is submitted that Dockerty teaches, *inter alia*, the air gap or minimum distance defined between the printed circuit board and the device as not defined by the solder paste, but rather is defined by the combination of expansion based on the heating of the solder paste. As such, it is respectfully submitted that these claims contain further patentable subject and are allowable not merely as being dependent upon an allowable base claim. Reconsideration and withdrawal is respectfully requested.

Regarding claims 5 and 18, Applicant resubmits the above position offered with regard to claims 1 and 15. Moreover, it is submitted these claims recite limitations including "at least one heat sink disposed on a top surface of the carrier substrate." In the present Office Action, the Examiner provides that the heat sink 27 is disposed on the substrate 24, where it is respectfully submitted that Dockerty actually teaches the heat sink disposed on the chip or cap 26, which is inconsistent with the claimed present invention. As such, it is submitted that these claims contain further patentable subject matter and are patentable not merely as being dependent upon an allowable base claim. Reconsideration and withdrawal is respectfully requested.

Regarding claim 6, Applicant respectfully resubmits the above position offered with regard to claims 1 and submits these claims contain further patentable subject matter in view thereof. Among other things, these claims recite limitations to the second members and solder members having an outer layer of solder material having the first melting temperature. On page

6 of the present Office Action, the Examiner asserts that the second members 11 include an outer layer of a solder material, first material having the first melting temperature, to which Applicant respectfully disagrees. Column 3 of Dockerty succinctly discloses that the solder balls 12 are composed of a 90/10 lead/tin high melting temperature solder and that the paste is composed of a resin and low temperature 37/63 lead/tin type solder. It is submitted that this is inconsistent with the claimed present invention. Should the Examiner maintain the present rejection, Applicant requests a showing indicating where Dockerty explicitly discloses the claimed second member and second solder balls having an outer layer consistent with the first temperature relative to the first solder member and first solder balls. Otherwise, Applicant requests reconsideration and withdrawal.

B. Claims 8-14, 17 and 23-26

Claims 8-14, 17 and 23-26 currently stand rejected under 35 U.S.C. §103(a) as being unpatentable over Dockerty in view of Burnette, U.S. Patent No. 5,956,606 (hereinafter referred to as "Burnette").

Applicant respectfully traverses and requests reconsideration. For the sake of brevity, Applicant respectfully resubmits the above offered position regarding the characterization of the teachings of Dockerty.

As understood, Burnett is directed to, *inter alia*, an electrical interconnection structure for connecting a first component 300 and a second component 320. The interconnection includes a first solder sphere 314 and a second solder sphere 318 stacked on top of each other. When a single temperature is applied, the shape of the electrical interconnection is maintained by reflowing solder paste to form solder connection 316 at a temperature low enough to prevent reflow of the first and second solder spheres 314 and 318. Burnette discloses, *inter alia*, the first solder sphere 314 and second solder sphere 318 having different diameters, but discloses these solder spheres as having composition of the same material, therefore having the same melting temperature.

Regarding claims 8-14, Applicant respectfully submits the present rejection is improper because the combination of Dockerty and Burnette fails to teach or suggest the claimed present

invention. In support of the present rejection at the bottom of page 5 of the present Office Action, the Examiner asserts that "with respect to claim 8, it recites limitations similar to claim 1, Dockerty et al. further teaches that a plurality of first solder paste (12) composed of a first material (lead 10) (see col. 3, lines 60-63). Dockerty et al. does not teach the first solder paste is the first solder ball. The Examiner further asserts that an obvious modification would have been to change the solder paste 12 of Dockerty with the solder ball 318 of Burnette, to which Applicant respectfully traverses. As discussed above, Dockerty specifically discloses the solder paste 12 as being screen deposited in the solder ball 11 pressed into the paste 12. It is submitted that if one of ordinary skill in the art utilized the second solder ball 318 instead of the solder paste 12 of Dockerty, this would not allow for the solder ball 11 to be pressed into the solder ball 318, thereby obviating the express disclosure of Dockerty.

Therefore, one of ordinary skill in the art would not be motivated to combine these references because Dockerty teaches away from the solder paste being a plurality of solder balls, as the Examiner has asserted. For example, Dockerty discloses using a spacer 6 for defining a depth between elements 1 and 3. This depth is designated by element 9 such that the solder ball 11 are pressed into the solder paste 12. The solder paste 12 was a solid solder ball, the disclosed pressing could not occur and the solder balls would have to, in fact, be balanced on each other until a soldering heat is applied. Furthermore, the solder balls would have to be held in alignment until a low temperature is applied, which would adversely affect the spacing based on size adjustments of the second solder ball, thereby adversely affecting the spacing defined as y in FIG. 2 of Dockerty. As such, reconsideration is respectfully requested.

Regarding claims 9 and 11-12, Applicant submits these claims contain further patentable subject matter and resubmits the above position offered with regard to claim 8. Furthermore, these claims recite limitations regarding to a dimension disposed between the printed circuit board and the integrated circuit as defined by the second members, or second solder balls. It is submitted that Dockerty teaches, *inter alia*, the air gap or minimum distance defined between the printed circuit board and the device as not defined by the solder paste, but rather is defined by the combination of expansion based on the heating of the solder paste. As such, it is respectfully submitted that these claims contain further patentable subject and are allowable not merely as

being dependent upon an allowable base claim. Reconsideration and withdrawal is respectfully requested.

Regarding claims 10 and 14, Applicant respectfully resubmits the above position offered with regard to claim 8. It is further submitted that these claims contain further patentable subject matter and are allowable not merely as being dependent upon an allowable base claim. As such, reconsideration and withdrawal is respectfully requested.

Regarding claim 17, Applicant respectfully resubmits that the above offered position with regard to claim 15. Applicant asserts confusion regarding this limitation and submit the rejection is improper for, at least the reason stated with regard to the rejection of independent claim 15. Previously in the present Office Action, the Examiner asserts that claim 15 is rejected as the combination of Dockerty and Matthies and as claim 17 provides further limitations therein, the Examiner has not provided any support regarding the elements as asserted to be taught or suggested by the combination of Dockerty with Matthies. In view thereof, Applicant respectfully submit the present rejection is improper for, among other reasons, that one of ordinary skill in the art would not combine these references as Dockerty teaches away from the solder paste 12 being a solder ball and that claim 17 contains further limitations from claim 16 dependent upon claim 15, wherein claims 15 and 16 stand rejected under separate indistinct prior art reference combinations. Therefore, reconsideration and withdrawal is respectfully requested. Should the Examiner maintain the present rejection, Applicant requests a showing of the claimed limitations as taught or suggested by Dockerty in combination with Burnette for independent claim 15, dependent claim 16 and presently rejected claim 17.

Regarding claims 23-26, Applicant submits herein, for the Examiner's consideration, amended claim 23 including the limitation in the method for making an integrated circuit wherein the plurality of first solder balls are applied using a solder dispensing machine and the plurality of second solder balls are applied using the solder dispensing machine. Applicant reiterates the above position regarding Dockerty teaching away from not only having a second solder ball as disclosed by Burnette instead of the solder paste 12, but also teaches away from the solder paste 12 being applied using a solder dispensing machine and in-fact teaches the exact opposite using a printing screen depositing method. Therefore, one of ordinary skill in the art

would not be motivated to combine any of the prior art references, specifically Dockerty and Burnette under the present rejection, as the combination thereof would be in direct contradistinction to the teachings of Dockerty and fail to produce the claimed present invention. As such, reconsideration and withdrawal is respectfully requested.

Accordingly, Applicant respectfully submits that the claims are in condition for allowance and that a timely Notice of Allowance be issued in this case. The Examiner is invited to contact the below-listed attorney if the Examiner believes that a telephone conference will advance the prosecution of this application.

Respectfully submitted,

Date: November 5, 2003

By: _____
Timothy J. Bechen
Registration No. 48,126

VEDDER, PRICE, KAUFMAN &
KAMMHOLZ, P.C.
222 N. LaSalle Street
Chicago, IL 60601
(312) 609-7500
FAX: (312) 609-5005